BOUNCING OF BUBBLES IMPACTING AT A FREE SURFCE

Francesc Suñol and Ricard González-Cinca

Universitat Politècnica de Catalunya, Barcelona, Spain.

The bouncing process of air bubbles (diameter range 0.2—2 mm) impacting at a free surface is studied from analysis of data obtained by means of a high-speed video camera. Experiments are conducted in a methacrylate tank filled with ethanol, into which single air bubbles are injected from a syringe. The position, shape and rise velocity of the bubbles are measured from the images recorded (Figure 1). Air bubbles with equivalent diameters below a certain critical value (d_{crit} ~ 0.47 mm) are found to vanish immediately after they reach the free surface. In contrast, bubbles with equivalent diameters above this critical value, bounce repeatedly before disappearing into the free surface. The time interval between the first contact of the bubble with the free surface and its disappearance, increases linearly with the Weber number, while the amplitude of the bounce increases with the bubble size. A numerical model is developed, in which the surface force is approximated as an harmonic oscillator, and is compared with the obtained experimental results.

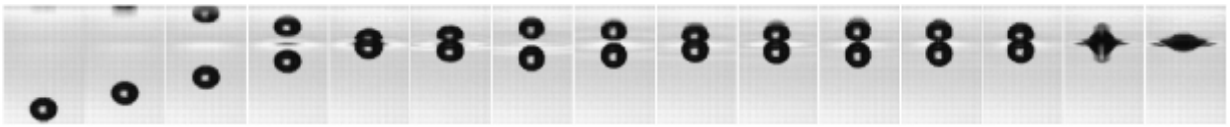

Figure 1: Snapshots of the process of a sample bubble bouncing after the collision with a free surface.